

REMARKS

Considering the matters raised in the Office Action in the same order as raised, the drawings have been objected to "as failing to comply with 37 CFR 1.84(p)(5)" because they do not include certain reference signs mentioned in the description. Copies of the relevant figures are submitted herewith wherein the missing reference signs are shown. In particular, reference numeral 45 is now shown in Figure 4 and reference numeral 400 is now shown in Figure 14.

The drawings have been objected to "as failing to comply with 37 CFR 1.84(p)(5)" because they include certain reference signs not mentioned in the description. The description has been amended to make mention of each of the reference signs in question.

The statement with respect to the need for formal drawings when the application is allowed is noted and formal drawings will be submitted in due course.

Claims 1-5, 9, 12, 21-23, 28, 33-35, 40 and 44-46 have been rejected under 35 USC 102(e) as being "anticipated by" the cited Christy patent while claims 6, 25, 27, 36, and 37 have been rejected under 35 USC 103(a) as being "unpatentable over" Christy in view of Schenato et al and claims 7, 8, 10, 11, 13, 14, 15-20, 25, 26, 29-32, 38, 39, and 41-43 have been rejected as "unpatentable over" Christy in view of Greenaway. These rejections are respectfully traversed although the claims have been amended to more clearly define over the references cited.

The Christy patent discloses a multi-layer barcode arrangement which employs wavelength separation in detecting the codes. The identification codes are provided on paper or a film-like material capable of receiving and retaining clear machine-readable imaging thereon. The first code layer is typically image using toner that is applied by electron beams or techniques such as ink jet printing or photocopying. The toner must be such as to provide a specific spectral response (in the case of the infrared-opaque toner) in contrast to the substrate so that there is no interference with the predetermined wavelength of the code underneath. As shown in Figure 1 and in other figures of the Christy patent, the data elements of the surface code must match the code data elements for the underneath layer (i.e., must be directly over the latter) and must be

used in conjunction with the special toner for the infra-red reader in order to permit the latter to see through the top barcode and thus read the barcode therebeneath. In another embodiment (Figure 5), the barcode therebeneath is covered by an opaque overlay that hides the sub-layer code from view, but because transmittal is only at a specific wavelength, the arrangement allows reading of the sub-layer code with the infra-red reader of the corresponding specified wavelength.

The multi-layer of the present invention does not use wavelength separation but rather uses an inducement and response approach with some of the sensors employed and a response approach for others. The invention does not rely at any time on any layer being clear or on any code being visible on the surface layer. All codes are preferably disposed underneath an upper layer and hidden for security purposes. To accomplish this, the present invention provides for the use of a sensor selected from the group consisting of x-ray, radar, capacitance, thermal, and magnetic sensors for reading the hidden codes. X-ray, for example, relies on the transmission of radiation through other codes for detection, whereas the standard definition of "opaque" as used in the Christy patent would rule out such a method. Similarly, micro-impulse radar can "read" through a wall and will seek the layer including the marked code that reflects the signal, regardless of any layer or layers disposed above the layer that includes the marked code. Capacitance sensing will determine the data elements of the sub-layer code based on the response to electric fields while thermal methods will read the sub-layer code based on differences between the heat absorbed and dissipated by the data elements. Magnetic sensors do not emit a magnetic field but rather measure the magnetic field generated by the magnetic material in the data elements. Thus, it will be appreciated that the present invention represents a very different approach from the wavelength separation approach disclosed in the Christy patent and because all the claims now recite that the sensor used is a sensor selected from the group consisting of x-ray, radar, capacitance, thermal and magnetic sensors, all of the claims presented are patentable over the Christy patent.

It is noted that the claims no longer refer to an ultrasonic method of reading codes. The Examiner has relied on the Schenato et al patent as disclosing this feature and while applicant does not necessarily agree that the proposed combination is a

proper one or that the resultant hybrid combination would be that claimed, the use of ultrasonic sensing for the basic sensor is no longer being claimed in the main claims. However, it is worth noting that the ultrasonic sensing used with the present invention differs from that of the Schenato et al patent. The latter teaches a method featuring the use of small metal plates to create blind holes that are detected by the absence of return signals when subjected to signals transmitted by ultrasonic transducers. The present invention does not rely on the negative aspect of blind holes from material that is missing, but rather relies on the positive aspect of a material that is present, which is arranged in a specific format or as a code. Further, the invention does not rely on embedded metal plates but rather on the elemental composition of the marking material in the code layer of interest. It is noted that the use of a metal plate would render the present invention useless as such a plate would impede the detection of codes on any other layers of plates. Moreover, the teachings of the Schenato et al reference would be of little value if a second or third layer of metal plates were to be employed. In this regard, the various layers could no longer be read unless holes from all of the layers were lined up perfectly to provide a resultant "blind hole." This alignment would, however, defeat the purpose of identification coding in that the alignment would no longer represent a pattern of a desired configuration.

With respect to the Greenaway patent, this patent discloses an identification card containing information in the form of optical markings disposed between two protective layers. In contrast, the present invention is concerned with the use of a neutral layer to separate substances or materials of different elemental composition that respond to different sensing mechanisms. The purpose is to prevent the mixing of elements on a single layer since such a mixture could potentially confuse a sensor and render the code on that layer unreadable. Although the Greenaway patent uses layers as a protective mechanism, one of which can be penetrated by infra-red light, the primary purpose of the layers is to ensure that the information in the code is destroyed if the layers are separated. Thus, the Greenaway patent and the present invention are concerned with different kinds of separating layers operating in different ways for different reasons. In this regard, the Greenaway layers are suitable only for identification cards whereas the present invention is suitable for direct marking.

With this background, it is noted that the dependent claims set forth a number of further features that are not disclosed by the references cited. For example, claim 7 (and other corresponding claims) recite that each of the marking layers comprises a different medium having characteristics detectable by different sensors of the group while claim 8 (and other corresponding claims) recite that each of the marking layers comprises a different medium having characteristics detected by different sensors and that the different sensors comprise at least two different sensors of the group consisting of x-ray, radar, capacitance, thermal, magnetic, and ultrasonic sensors. There is no teaching in any of the references with respect to the use of using more than one sensing method, i.e., at least two different methods, for sensing different marking layers. In this regard, in the Christy patent, the same type of sensors are used for sensing different wavelengths rather than two materially different types of sensors as claimed in these specific claims and other corresponding claims presented.

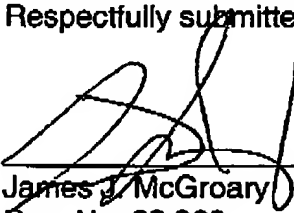
In addition, none of the references disclose the fragmentation of a matrix code so as to make it possible to put parts of a code on different layers and aligning the different parts to be read as a complete code when a sensor looks through the layers. Other dependent claims set forth further features not disclosed by the references and, in this regard, it is not agreed that the various manufacturing methods claimed are obvious from the references relied on. Of course, these and all of the other dependent claims are patentable for at least the reasons set forth above in support of the patentability of the claims parent thereto.

Allowance of the application in its present form is respectfully solicited.

Respectfully submitted,

4/14/03

Date



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ATTACHMENT A
Amendments to the Specification

At the following locations, a marked up copy of the replaced paragraph is provided.

Page 8, paragraphs [0037] - [0039]:

A1 [0037] In another, ~~alternate~~alternative form shown in Figure 4, the multiple layer label 40 comprises layers offset (i.e., staggered) from one another on a substrate 42. Multiple layer label 40 comprises alternate marking layers 44 and neutral layer 46 formed offset from marking layer 45 and neutral layer 47 formed ~~there below~~ therebelow (Figure 4). As a result, edge 48 of marking surface 45 is exposed (i.e., not covered by neutral layer 46 or marking layer 44).

[0038] Multiple layer label 50 represents an alternate offset design (Figure 5) on a substrate 52. Each subsequent layer, of both marking layerlayers 54 and 55 and neutral layerlayers 56 and 57, is formed on a previous layer at an offset exposing both edges of the previous layer below. For example, marking layer 54 is formed on neutral layer 56 such that the edges 58a, 58b are exposed. Similarly, neutral layer 56 is formed on marking layer 55 such that edges 59a, 59b of marking layer 55 are exposed.

[0039] Referring now to Figure 6, multiple layer identification label 60 represents yet another multiple layer label having offset layers disposed on a substrate 62. Shown as a top view, each subsequent layer is staggered relative to a layer below such that the edges are exposed. For example, marking layer 64 is formed on neutral layer 66 exposing edges 68 of neutral layer 66. Similarly, neutral layer 66 is formed on marking layer 65 exposing edges 69.

Page 14, paragraph [0059]:

A2 [0059] Referring now to Figure 13, tape medium 330 may be used to carry multiple image sensitive media 340, with an intervening neutral layer 250. The media 3340 include a such as magnetic medium 342, x-ray medium 344, radar medium 346, and infrared medium 348 on the surface of tape medium 330 which will come into

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contact with a substrate to be marked. The transfer method by which image sensitive media 340 is transferred to a substrate is the same as the method used with tape medium 230. The various image sensitive media 340 are indexed into position such that alternate image sensitive media 340 is transferred forming an identifiable symbol to a substrate or previously deposited neutral layer until a desired multiple layer label is formed.

ATTACHMENT B
Amendments to the Claims

Following herewith is a complete listing of the claims, including a marked copy of the currently amended claims.

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- A3
1. (Currently Amended) A machine readable multiple layer label to be read by a sensor, said label comprising:
a plurality of machine readable marking layers stacked one upon another, each said marking layer encoding an identification symbol detectable using thea sensor selected from the group consisting of x-ray, radar, capacitance, thermal and magnetic sensors.
-
2. (Original) The machine readable multiple layer label of claim 1, wherein said identification symbol comprises a two-dimensional symbol.
3. (Original) The machine readable multiple layer label of claim 2, wherein said two-dimensional symbol comprises a matrix forming an encoded array.
4. (Original) The machine readable multiple layer label of claim 1, wherein the symbols encoded by the marking layers are adapted to be detected using a sensor providing non-optical detection of said symbols.
5. (Original) The machine readable multiple layer label of claim 1, wherein said marking layers are comprised of the same sensing medium.
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- A4
6. (Currently Amended) The machine readable multiple layer label of claim 5, wherein said identification symbols of said marking layers are adapted to be detected by aan x-ray sensor comprising one of the group consisting of a x-ray sensor and an ultrasonic sensor having tomographic capability.
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7. (Currently Amended) The machine readable multiple layer label of claim 1, wherein each of said marking layers ~~comprise~~comprises a different medium having characteristics detectable by different ~~respective sensors~~ of said group.

8. (Currently Amended) The machine readable multiple layer label of claim 7, wherein each of said marking layers comprises a different medium having characteristics detectable by different sensors, and said different sensors comprise at least two different sensors of the group consisting of x-ray, radar, capacitance, thermal, magnetic, and ultrasonic sensors.

9. (Original) The machine readable multiple layer label of claim 1 further comprising an opaque layer disposed over said plurality of machine readable marking layers.

10. (Original) The machine readable multiple layer label of claim 1 further comprising at least one neutral layer disposed between two of said plurality of marking layers.

11. (Original) The machine readable multiple layer label of claim 1 further comprising a plurality of neutral layers, each of said neutral layers separating two of said plurality of marking layers.

12. (Original) The machine readable multiple layer label of claim 1 wherein said marking layers are stacked in an offset manner from one another.

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13. (Currently Amended) A method for producing a multiple layer machine readable identification label, said method comprising the steps of:

(a) applying a marking medium to a substrate layer to form a marking layer encoding a machine readable identification symbol therein, the marking medium having a detecting value that differs from that of the substrate layer and being detectable by a

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sensor selected from the group consisting of x-ray, radar, capacitance, thermal and magnetic sensors;

- (b) applying a neutral layer on the marking layer for spacing;
 - (c) repeating steps (a) and (b) until the desired number of marking layers are formed and using the most recently applied neutral layer as the substrate layer for the successive marking layer.
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14. (Original) The method of claim 13 wherein the step of applying a marking medium comprises a step of applying a marking medium to form an offset marking layer.

15. (Original) The method of claim 13, wherein the step of applying a marking layer comprises:

- applying a stencil having openings to the substrate layer; and
- backfilling the openings with the marking medium.

16. (Original) The method of claim 13, wherein the step of applying a marking layer comprises:

- applying a transfer tape to the substrate layer, the transfer tape having an image composed of the marking medium formed thereon; and
- inducing the image from the transfer tape to the substrate layer.

17. (Original) The method of claim 13, wherein the step of applying a marking layer comprises:

- removing marking medium in selected area to form the machine readable identification symbol.

18. (Original) The method of claim 13, wherein the step of applying a marking layer comprises:

- forming a recess in the substrate layer; and
- backfilling the recess with the marking media.

19. (Original) The method of claim 13, further comprising aligning images used to form a segmented symbol.
20. (Original) The method of claim 13, further comprising:
dividing a symbol into at least two segments; and
the step of applying marking medium to a substrate layer includes a first step which encodes a first of the at least two segments and a second step which encodes a second of the at least two segments.
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21. (Currently Amended) An automatic identification system, said system comprising:
Ab a plurality of machine readable marking layers stacked one upon another, each of said marking layers encoding a respective identification symbol, and
sensor means for detecting said respective identification symbol of each of said marking layers, said sensor means comprising a sensor selected from the group consisting of x-ray, radar, capacitance, thermal and magnetic sensors.
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22. (Original) The system of claim 21, wherein at least one of said identification symbols comprises a two-dimensional symbol.
23. (Original) The system of claim 22, wherein said two-dimensional symbol comprises a matrix forming an encoded array.
24. (Original) The system of claim 21, wherein said plurality of machine readable marking layers are comprised of the same medium and
said sensor means comprises a sensor with tomographic capabilities for reading said respective identification symbol from each of said marking layers.
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25. (Currently Amended) The system of claim 21, wherein each of said marking layers comprises a different medium having different characteristics; and
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said sensor means comprises a ~~plurality of~~ at least two different sensors of said group, each of the different sensors detecting said symbol from a respective marking layer.

26. (Currently Amended) The system of claim 2521, wherein each of said marking layers comprises a different medium having characteristics detectable by different sensors, and said different sensors comprise two of the group consisting of x-ray, radar, capacitance, thermal, magnetic, and ultrasonic sensors.

27. (Currently Amended) The system of claim 24 wherein said sensor comprises ~~one of the group consisting of an x-ray and ultrasonic sensors~~ sensor.

28. (Original) The system of claim 21, further comprising an opaque layer disposed over said plurality of machine readable layers.

29. (Original) The system of claim 21, further comprising at least one neutral layer disposed between two of said plurality of marking layers.

30. (Original) The system of claim 21, further comprising a plurality of neutral layers, each said neutral layers separating any two of said plurality of marking layers.

31. (Original) The system of claim 21, wherein identification symbols of at least two of said marking layers comprises a first symbol fragment and a second symbol fragment.

32. (Original) The system of claim 31 further comprising a processor for assembling said first symbol fragment and said second symbol fragment after detection thereof to thereby form a complete symbol.

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33. (Currently Amended) A method of automatic identification, said method comprising the steps of:

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applying a multiple marking layer label onto a component, each marking layer encoding a respective identification symbol; and

detecting the respective identification symbol from each marking layer using a sensor selected from the group consisting of x-ray, radar, capacitance, thermal and magnetic sensors.

34. (Original) The method of claim 33, wherein the identification symbol comprises a two-dimensional symbol.

35. (Original) The method of claim 33, wherein the two-dimensional symbol comprises a matrix forming an encoded array.

36. (Original) The method of claim 33, wherein each marking layer is comprised of the same medium and said step of detecting the respective identification symbol comprises the step of detecting each identification symbol using a sensor which has tomographic capabilities for reading the identification symbols from each said marking layer.

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37. (Currently Amended) The method of claim 36 wherein the sensor comprises ~~one of the group consisting of an x-ray and ultrasonic sensors~~ sensor.

38. (Currently Amended) The method of claim 33, wherein each marking layer comprises material having different characteristics and the step of detecting the respective identification symbol comprises detecting each identification symbol using a ~~plurality of~~ at least two different sensors of said group, each sensor detecting the symbol from a respective marking layer.

39. (Currently Amended) The method of claim 38, wherein each marking layer comprises material having different characteristics from that of other said marking layers, the step of detecting the respective identification symbol comprises using at

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least two different sensors. and the different sensors comprise two of the group consisting of x-ray, radar, capacitance, thermal, magnetic, and ultrasonic sensor.

40. (Original) The method of claim 33, further comprising applying an opaque layer over the label.
41. (Original) The method of claim 33, wherein the label further comprises a neutral layer disposed between two of the plurality of marking layers.
42. (Original) The method of claim 33, wherein the respective identification symbol encoded in at least two marking layers comprise a respective symbol fragment.
43. (Original) The method of claim 42, further comprising the step of assembling detected symbol fragments thereby forming a complete symbol.
44. (Original) The method of claim 33, wherein the step of detecting the respective identification symbol from each marking layer comprises the steps of:
collecting analog image signals emitted from the label; and
converting the analog image signals to a digital signal string using an analog to digital converter.
45. (Original) The method of claim 44, further comprising the step of converting the digital signal string into an ASCII data string.
46. (Original) The method of claim 45, further comprising the step of converting the ASCII data string to a video signal that can be displayed on a video monitor.

ATTACHMENT C
Amendments to the Drawings

Amended drawing sheets (specifically Figures 4 and 6) are provided hereafter to replace the prior versions of those drawing sheets. The changes made in the amended drawing sheets have been accomplished using replacement figures, and the changes made to the replacement figures are explained in the Remarks section.

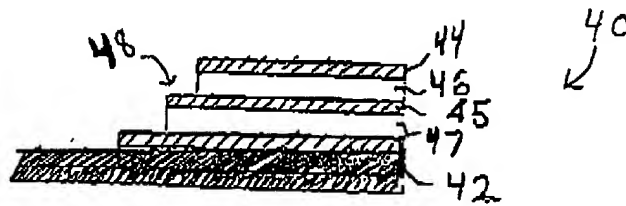


FIG. 4

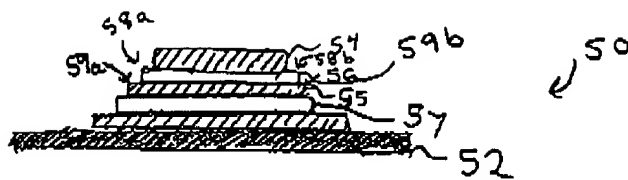


FIG. 5

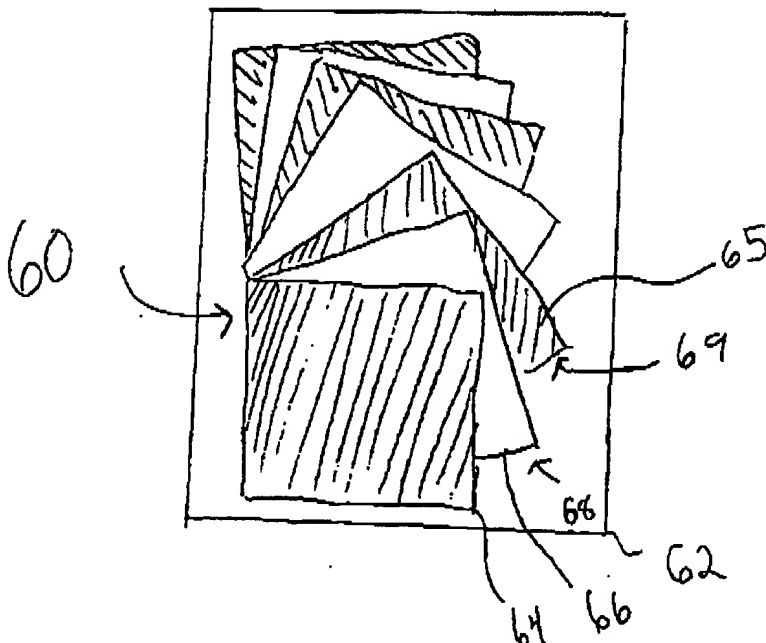


FIG. 6

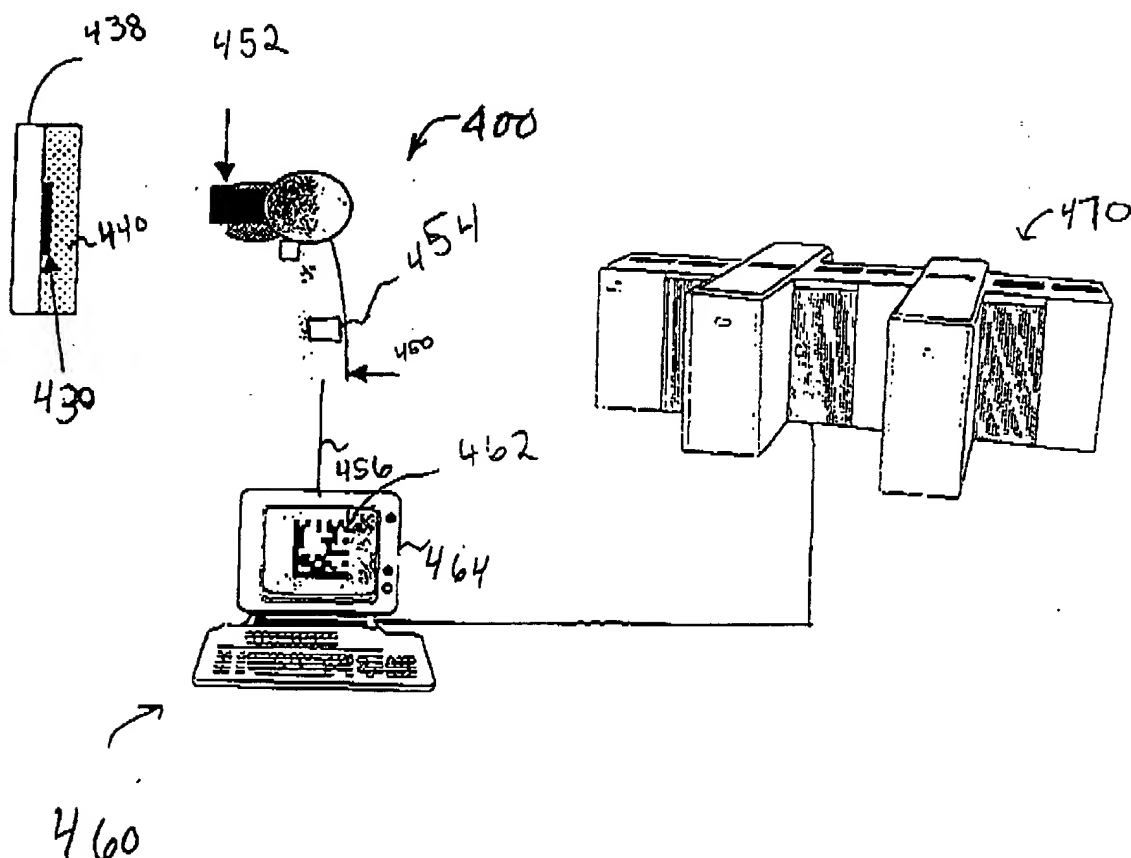


FIG. 14